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ARMY CORPS OF ENGINEERS NEWS CONFERENCE  
ON THE DUWAMISH PCB SPILL

5 March 1976

PROJECT DESCRIPTION

Background. An electrical transformer containing polychlorinated biphenyls (PCB's) was dropped during a barge loading operation on 13 September 1974. As a result of this accident, 265 gallons of PCB's were spilled into the slip adjoining the Duwamish Waterway in Seattle.

Because of the chronic toxicity of PCB's, action was taken by the State of Washington Department of Ecology (DOE) and the U.S. Environmental Protection Agency (EPA) to remove the pollutant from the bottom of the slip and navigation channel. Divers utilized small hand-held suction dredges to pump water, PCB's, and contaminated bottom sediments into settling tanks. An estimated 70 to 90 gallons of PCB's were removed before the operation terminated on 31 October 1974. However, these small dredges were not capable of removing large quantities of the bottom sediments which the PCB's had permeated. Post-cleanup sampling showed high concentrations remained in the immediate area. DOE and EPA decided that bottom sediments in the contaminated area must be removed.

The U.S. Army Materiel Command was assessed liability for the accident due to faulty packing of the transformer. The Seattle District, U.S. Army Corps of Engineers, on request from the Department of Defense, was assigned responsibility for removal of the contaminated sediments, and coordinate all efforts with DOE, EPA and other appropriate agencies.

Project Area. The PCB's were spilled in Slip 1 adjoining the Duwamish Waterway at River Mile 1.5. At this point the depth of the waterway is at 26 to 30 feet MLLW. The slip was built at approximately an 80° angle to the waterway, and is about 600 feet long and 150 feet wide. Slip 1 and the navigation channel adjacent to the slip contain most of the PCB's. In recent months, some PCB's have been dispersed from this area by river current and tidal action, and have been absorbed by the bottom sediments. Before the PCB's were spilled, these bottom sediments were unacceptable for deepwater disposal because of other contaminants.

Cleanup Plan. The plan is to dredge approximately 40,000 cubic yards of contaminated bottom sediments from the area around Slip 1 and the adjoining Duwamish Waterway. Figure 1 shows the proposed dredging area, and



the concentrations of PCB's in the bottom sediments, as determined by EPA on 2 June 1975. The flood waters of December 1975 flushed some of the PCB's from the waterway, and also distributed them more uniformly in the area of Slip 1. Figure 2 shows the concentrations of PCB's on 16 January 1976, as determined by EPA. Since then, the recommended area of dredging was expanded in the area of Slip 1, but reduced in the waterway. The dredged material will be placed in a prepared disposal site at about River Mile 1 on land owned by Chiyoda International Corporation (figure 3). After it has solidified, the contaminated material will be covered with at least 3 feet of clean material. Dredging was scheduled to begin 2 March 1976, and be completed before 1 April 1976.

Dredging and Disposal Method. The dredging equipment, which has not been used previously in the Puget Sound area, is described in the following paragraph. Because the sediments are contaminated, extensive precautions are being taken to prevent suspended sediments from escaping either the dredging or disposal area.

Dredging Method. The PNEUMA SYSTEM Dredge, which is patented, will be used to remove the contaminated sediments. This dredge has the capability of pumping a slurry consisting of over 60 percent sediments compared with the hydraulic dredge which pumps only 20 percent sediments. This particular feature is desirable because of the need to reduce the volume of water to be filtered and removed from the disposal area.

The suction principle of the PNEUMA SYSTEM Dredge will minimize turbidity, which will minimize the amount of contaminated sediments that are placed into suspension in the estuary where particles can be ingested by plankton or other food chain organisms.

The dredge also provides good control of dredging depth which will help to limit the volume of sediments, and the size of the disposal site as much as possible. Bottom sediments will be dredged to a depth of about 2 feet.

The PNEUMA SYSTEM Dredge consists of three cylinders which operate consecutively to provide a uniform flow of dredged material. The bottom sediments and some water enter a cylinder. When the cylinder is full, compressed air then is introduced and forces the liquid into the discharge pipe. When the cylinder is nearly empty, the air is discharged into the atmosphere which permits the cylinder to refill with bottom sediments. Figures 4 and 5 depict the operation of the dredge.

The leased dredge equipment will be installed on the U.S. Army Corps of Engineers vessel PUGET. This is a 105-foot-long debris pickup vessel which will be used for the dredging project.

Disposal. The disposal site is located on property owned by Chiyoda International Corporation. The site is an abandoned sewage treatment plant formerly used by the city of Seattle, and has been acquired by Chiyoda for an industrial site.

The abandoned sludge ponds (figure 3) will be deepened and the material used to build dikes around the disposal area which will be large enough to contain 40,000 cubic yards of contaminated material dredged from Slip 1. The contaminated material will be placed in Pond 1 and the outflow passed over a weir into Pond 2. The water will then be pumped through sand and charcoal filters, and discharged into the Duwamish Waterway. The filters will remove particulates from the water at the approximate rate of 200 gallons per minute. To assist in precipitating the finer sediments, a flocculent may be added to the slurry as it enters Pond 1. The sediments that are contaminated with PCB's are expected to take 3 to 6 months to solidify. Then, the disposal site will be covered with about 3 feet of material that was previously excavated from the site, or with clean dredged material.

Monitoring. The EPA will monitor water quality before, during and after the dredging operation, and will analyze sediments. Sampling already completed by EPA has been used to estimate the area and quantities of material to be dredged. Sediments will be analyzed for PCB's, trace metals, nutrients, oil and grease and other parameters, and the amount of each which is released into the water. The Standard Elutriate Test, developed by EPA, will be used. Site monitoring of dissolved oxygen, conductivity, immediate oxygen demand, pH, temperatures, sulfide, suspended sediments and alkalinity will be done. A river evaluation program near the disposal site will be done by the EPA, and will include control measurements. Post-dredging sampling as necessary will be performed by EPA.

Other Considerations. The property owner will not be permitted to rehandle the contaminated sediments from the disposal area without assuming liability to insure proper disposal of sediments which are removed. This will place certain restrictions on building on the disposal area in the future.

### ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

Polychlorinated Biphenyls (PCB's). The purpose of the action is to remove bottom sediments which are highly contaminated with PCB's (Aroclor 1242). PCB's are synthetically prepared chemicals which have three physical characteristics that make them desirable compounds for industrial use: high boiling point, low water solubility, and high dielectric constants. They are used extensively in various industries as insulative

coolants in transformers and capacitors.

Before 1971, PCB's were used in many other industrial products such as braided insulators in electrical wiring and cable coating, high pressure hydraulic fluids, gasket sealers, cutting oil, epoxy paints, carbonless reproducing paper, adhesives, plastic containers and the like. Environmental concerns prompted the single U.S. supplier, Monsanto Chemical Corporation, to restrict distribution to use in sealed containers such as transformers and capacitors.

About 40,000,000 pounds of PCB's are reportedly produced annually; however, most of the current production is a lower chlorinated compound which reportedly is more biodegradable. PCB's are expected to remain an environmental problem for a number of years despite trends to more environmentally acceptable products. The major source of this contaminant is from landfills where the gradual breakdown of industrial products containing polychlorinated biphenyls is occurring. Hundreds of millions of capacitors have been discarded, carbonless copy paper used before 1971 is still being burned or discarded, and PCB's from other sources are gradually ending up in the Nation's waters.

PCB's are among the more persistent organic chemicals and degrade very slowly in the environment. They are nearly insoluble in water, but are fat-soluble; consequently, they concentrate in animal tissue.

Interest in PCB's has arisen because they frequently are found in fish, birds, sediment and water samples. They were not discovered in environmental samples until recently because (1) they are not deliberately distributed about the ecosystem, (2) they have a low acute toxicity and, therefore, are not immediately detected, and (3) they are difficult to detect. In many ways, PCB's act like chlorinated hydrocarbon pesticides such as DDT.

PCB's are not acutely toxic; a maiming effect or death is not immediate. However, chronic toxicity has resulted in a slow accumulation of poison, has a sublethal effect, and may constitute the most serious threat to the environment. This chronic effect apparently has the greatest impact on wildfowl, and has resulted in disruption of normal breeding patterns and formation of thin-shelled eggs. PCB's activate enzymes in the liver which cause, indirectly, the low calcium problem. PCB's are more effective than DDT by as much as 4-5 times in this enzyme activity. PCB's also tend to delay breeding time significantly. Many ornithologists feel that late breeding has a stronger influence on the reduction of bird populations than thin-shelled eggs. There is also indication of increased susceptibility to viral infection in birds. In addition, mammals have demonstrated reproductive failures, liver damage, lowered disease immunity, failure to gain weight and suspected increase in cancer.

Studies have shown the concentrations which are harmful to birds and mammals are passed through the food chain, increasing the concentration from hundreds to thousands of times from prey to predator. Based on available data, PCB's are present in varying concentrations in every species of wildlife on the earth.

Water Quality. If the PCB's were left in the Duwamish Waterway, contaminated bottom sediments would gradually be dispersed into the water column and ingested by plankton. The greatest concentration of PCB's are taken into the food chain when attached to suspended sediments and available to plankton. Although nearly insoluble in water, PCB's can be found in measured quantities in solution, and are expected to average 400 parts per trillion in the return waters from the disposal area.

The dredging and disposal activity may place some PCB's back into suspension. This cannot be entirely eliminated; however, the "suction" principle of the PNEUMA SYSTEM Dredge would minimize turbulence in the dredging area. Care will be exercised in this phase of work. If water quality is excessively degraded, any decision to stop dredging would be coordinated with EPA and DOE.

Disposal of the contaminated sediments will necessitate removing large volumes of water from the disposal area. About 8 to 9 million gallons of water will be passed through sand and charcoal filters to remove suspended sediments containing PCB's. If necessary, a flocculent (Nalco 634) may be used to improve settleability of sediments in the disposal area, to increase the efficiency of the dredging operation, and to reduce resuspension of sediments into the water column.

Fish and Wildlife. If the contaminated materials were left in place, many of the PCB's would enter the food chain because of biological activity in the area. Also, the contaminants are more likely to reenter the water column as the suspended sediments are dispersed by tidal current action, turbulence from vessel traffic, and the need to maintain the navigation channels using standard dredging techniques. The proposed action will reduce the amount of PCB's which could impact the food chain and, subsequently, fish and wildlife. Juvenile salmonoids will be migrating seaward before April 1 (1976) when the proposed dredging will be completed. Because the discharge waters will be filtered through sand and charcoal, the impact of PCB's in solution is not expected to have a measurable impact on fish. Use of the proposed disposal site will have little impact on fish and wildlife. However, any animals or birds that become mired in the disposal site may succumb.

Coordination. Close coordination is being maintained with EPA and DOE. Representatives from both agencies have attended the meetings at

which all decisions were made, and have mutually agreed upon the procedures for dredging and disposal.

Additionally, coordination is continuing with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Washington Department of Fisheries, and Washington Department of Game. Local agencies and adjacent property owners have been contacted. Also, the Seattle Audubon Society has provided information.

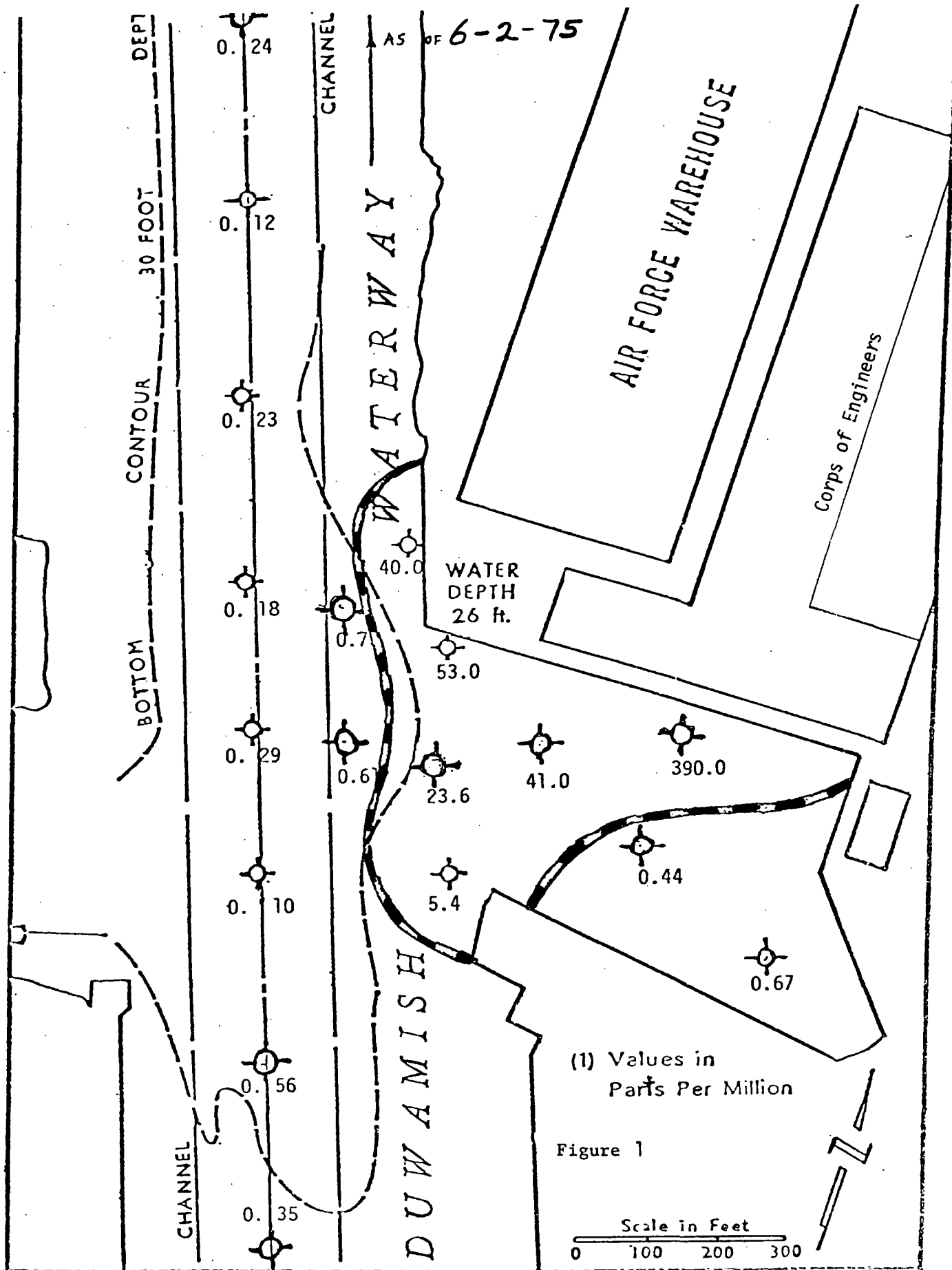


Figure 1

P.C.B. SEDIMENT CONCENTRATION

AS OF 6-2-75

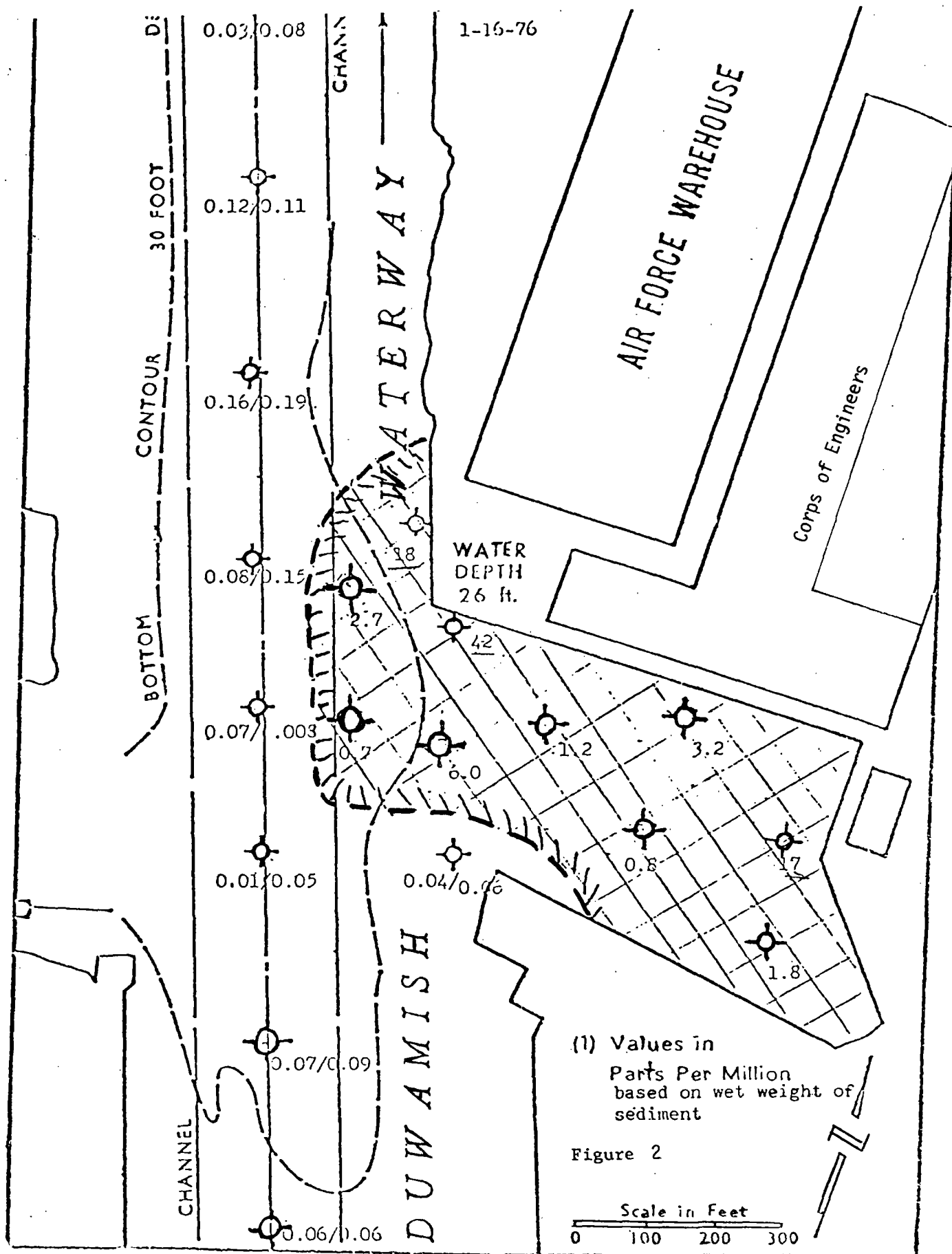


Figure 2

P.C.B. SEDIMENT CONCENTRATION  
AS OF 1-16-76



EAST MARGINAL WAY (2)

PROPERTY LINE

Filter Truck

Pond 2

A

A

(4)

DIAGONAL AVENUE (3)

(1)

WEST OREGON STREET

6+00

5+00

4+00

3+00

2+00

1+00

0+00

Pond 1

170'

200' MIN.

SLUDGE POND

SLUDGE POND

SLUDGE POND

Adjacent Property Owners:

(1), (2), (3) City of Seattle

(4) Chiyoda International Corporation

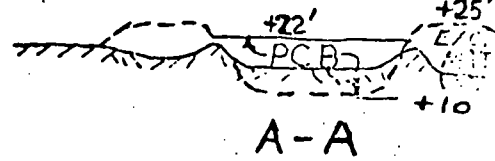
Figure 3

PROPOSED PCB  
UPLAND DISPOSAL.

IN: Duwamish Waterway  
AT: Seattle  
COUNTY: King STATE: WA  
APPLICATION BY: Seattle District  
Corps of Engineers

Figure 3

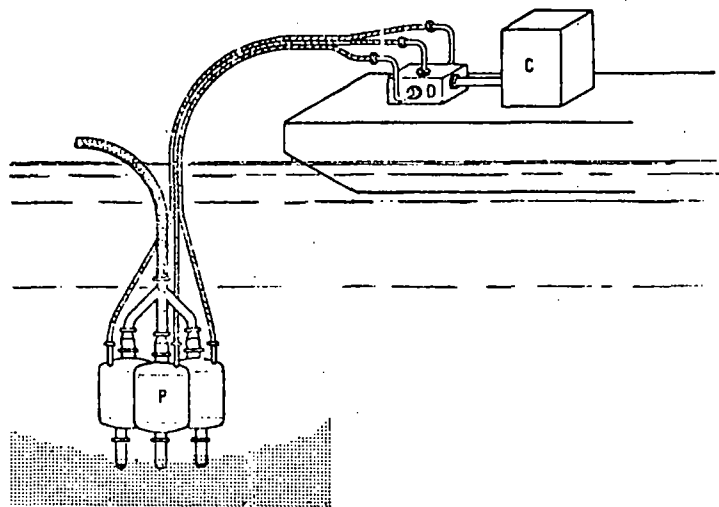
100 0 100  
SCALE IN FEET



PIER HEAD LINE

EBB FLOOD

DUWAMISH WATERWAY



C = compressor  
 D = distributor  
 P = pump body

Figure 4 - PNEUMA SYSTEM Dredge showing three cylinders of pump body, distributor and compressor.

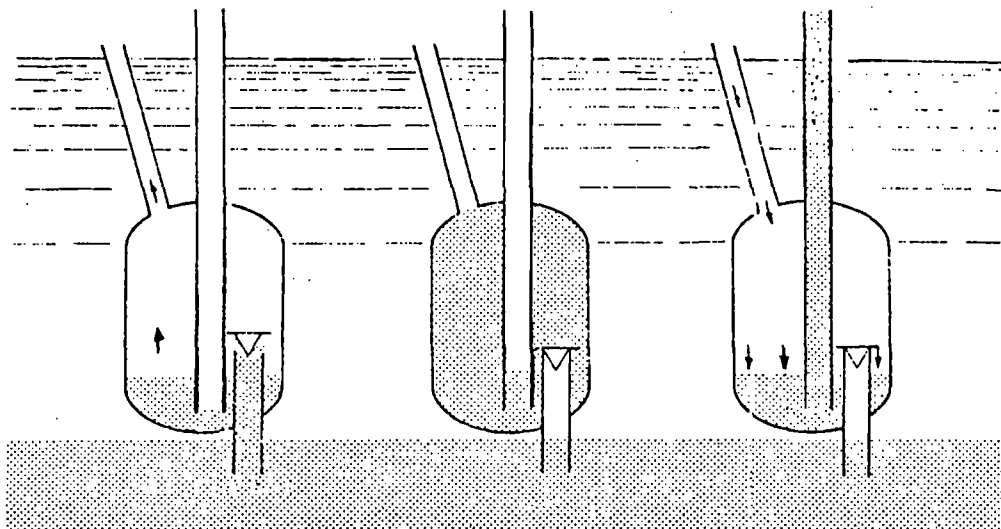


Figure 5 - Operation of cylinder of PNEUMA SYSTEM Dredge.



KEILLOC

DND  
E. (outside docks)  
A

B

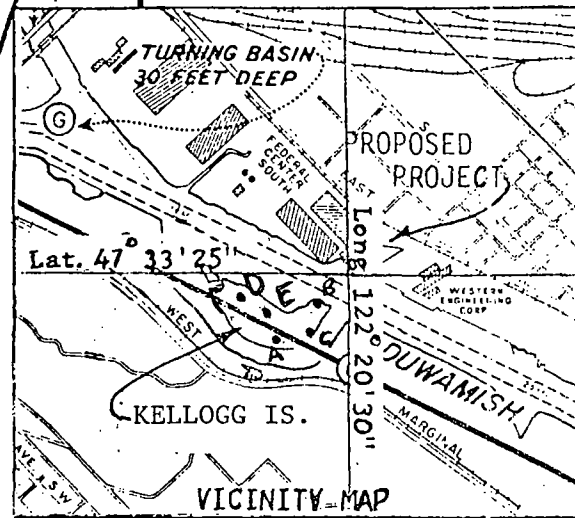
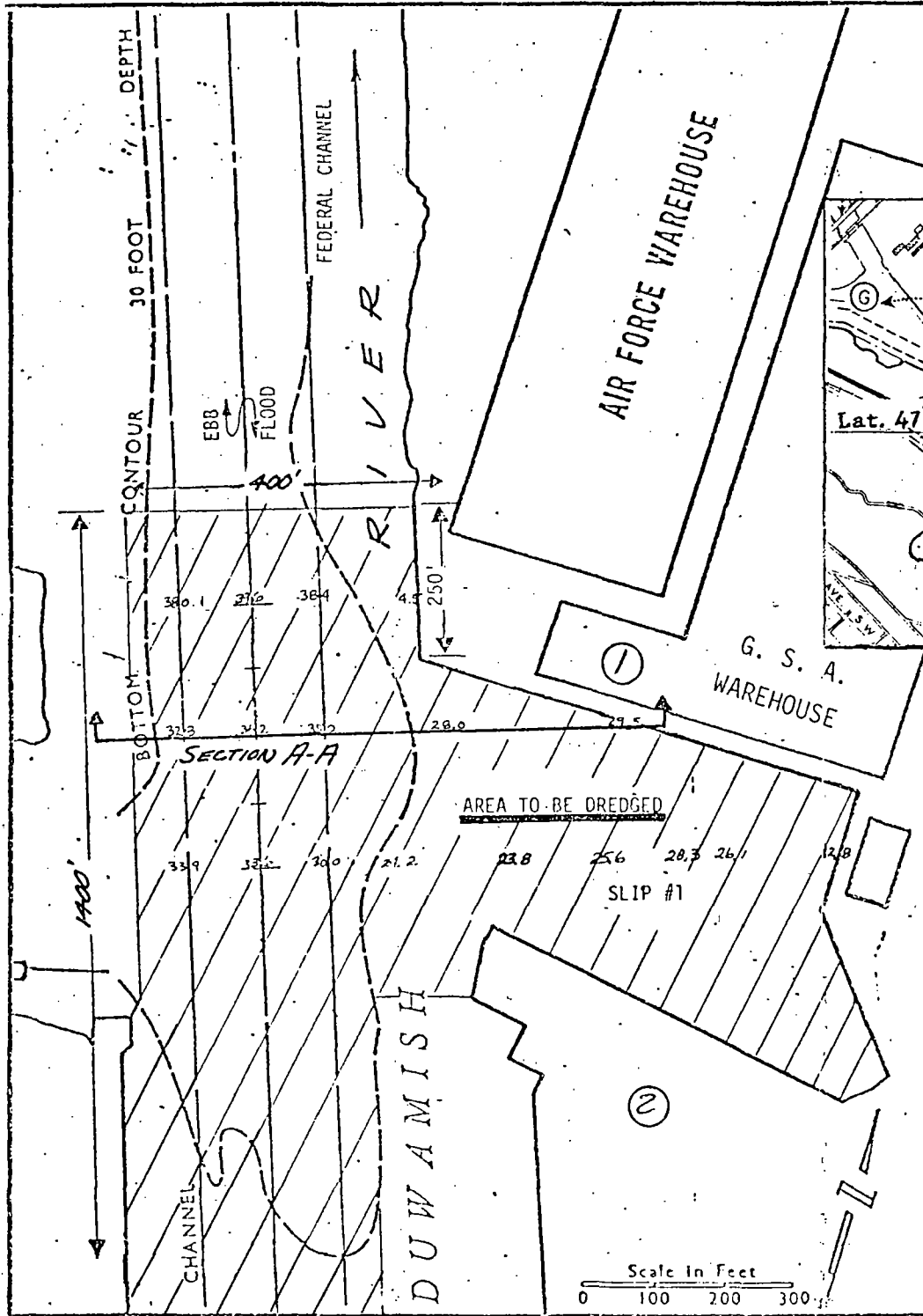
C



X 1,626

X 1,627

*Rev*  
*See conditions*  
*#12. Prob*



**NOTE:**

Approximately 50,000 cubic yards of sands and silts will be removed using a pipeline dredge. Upland disposal on Kellogg Island with dredge overflow waters returning to the Duwamish River.

Federal harbor lines are not established.

Soundings are in feet.

**PURPOSE:** Remove Polychlorinated Biphenyl Contaminated Material  
**DATUM:** Mean Lower Low Water 0.2' N.O.S.

**ADJACENT PROPERTY OWNERS:**

- ① South: Government Services Administration  
 GSA Center, Auburn, WA 98002
- ② North: Manson Engineering & Construction Co.  
 P.O. Box 24067  
 Seattle, Washington 98124

071-0YB-1-002876

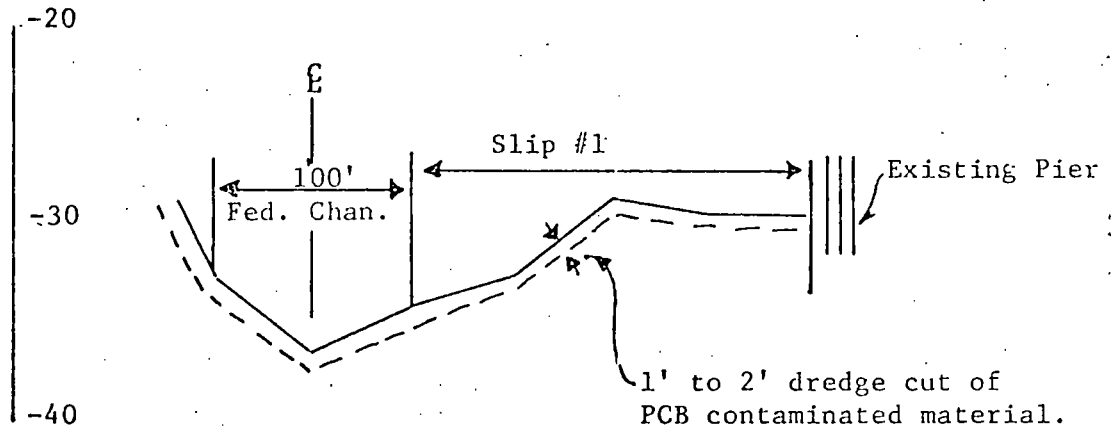
**PROPOSED DREDGING, UPLAND DISPOSAL**

**IN** Duwamish River  
**AT** Seattle

**COUNTY OF** King **STATE** WA

**APPLICATION BY** Seattle District Corps of Engineers, Seattle

**SHEET** 1 **OF** 2 **DATE** 9/3/75



SECTION A-A

SCALE: 1" = 200'-0"

071-0YB-1-002876

PROPOSED DREDGING

IN Duwamish Waterway

AT Seattle

COUNTY OF King STATE WA

APPLICATION BY Seattle District  
Corps of Engineers, Seattle